In the Claims:

1. (Currently Amended) A method for automatic adaptive control of a predetermined multi-stage manufacturing process, said multi-stage manufacturing process being defined by ~~cells~~ process stages, the method comprising

A. defining an interconnection cell in association with one of said process stages, said interconnection cell having associated therewith

I. at least one set of input data representing said manufacturing process or at least one set of manufacturing process control parameters, and

II. at least one set of output data, usable for predicting the process output for a given setting;

B. for the interconnection cell, processing data from said at least one set of input data and from at least one set of output data, using a predetermined prediction model into respective corresponding data record clusters; thereby to associate settings for respective process stages of said multi-stage process to respective outputs of said process stages or said process.

2. (Currently Amended) The method according to Claim 1 wherein defining an interconnection cell includes representing the interconnection cell as corresponding to a single one of said process ~~stage~~ stages in a process map.

3. (Currently Amended) The method according to Claim 1 wherein defining an interconnection cell includes representing the interconnection cell as corresponding to a group of contiguous ones of said process stages in a process map.

4. (Currently amended) The method according to Claim 1 wherein defining an interconnection cell includes representing the interconnection cell as corresponding to a group of non contiguous ones of said process stages in a process map.

5. (Currently Amended) The method according to Claim 1 wherein defining an interconnection cell includes representing the interconnection cell as corresponding to a group of cells in a process map which includes therein substantially every one of said process ~~stage~~ stages in the process map.

6. (Original) The method according to Claim 1 wherein defining an interconnection cell includes representing the interconnection cell as corresponding to at least two interrelated interconnection cells in a process map.

7. (Original) The method according to Claim 1 wherein said at least one input data set includes historical empiric data obtained from a previously performed like-process.

8. (Original) The method according to Claim 1 wherein said at least one input data set includes data currently being obtained from a substantially presently ongoing like-process.

9. (Original) The method according to Claim 1 wherein defining the interconnection cell includes associating therewith derived data.

10. (Original) The method according to Claim 1 wherein defining the interconnection cell includes associating therewith values generated by a Design-Of-Experiments assessment of the predetermined process juncture; to be used for initialization of a like-process.

11. (Original) The method according to Claim 1 wherein defining the interconnection cell includes associating therewith values computed using at least one predetermined formula.

12. (Original) The method according to Claim 1 wherein defining the interconnection cell includes validating at least one set of the at least one set of input data to the interconnection cell as respectively having a substantially significant correlation with a set of the at least one set of output data.

13. (Original) The method according to Claim 12, wherein said validating includes calculating a correlation coefficient between a selected set of the at least one set of input data, and the at least one set of output data; for the interconnection cell.

14. (Original) The method according to Claim 1 wherein assigning at least one boundary value includes analyzing data in the respective set wherein the at least one boundary value is to be assigned.

15. (Original) The method according to Claim 14 wherein analyzing data in the respective set includes examining the data according to at least one predetermined criterion.

16. (Previously Presented) The method according to Claim 15 wherein examining the data according to at least one predetermined criterion includes electing a criterion selected from the list of:

A. Input constraints -

I. within a specification limit,

II. within a range of values,

III. below an upper limit,

IV. above a lower limit,

V. closest to a mid-range value,

VI. closest to a previously used value;

B. Process constraints -

I. closest recipe to most recent recipe,

II. within a specification limit,

III. within a range of values,

IV. below an upper limit,

V. above a lower limit,

VI. closest to a mid-range value; or

C. Output goals -

I. within a specification limit,

II. within a range of values,

III. a predetermined target value,

IV. an upper specification limit,

V. a lower specification limit,

VI. below an upper limit,

VII. above a lower limit,

VIII. closest to a mid-range value.

17. (Original) The method according to Claim 1 wherein processing includes summarizing data in each respective corresponding data record cluster.

18. (Original) The method according to Claim 1 wherein processing includes implementing a Run-to-Run process control mode.

19. (Original) The method according to Claim 1 wherein processing includes running a feed back closed control loop.

20. (Original) The method according to Claim 1 wherein processing includes running a feed forward closed control loop.

21. (Original) The method according to Claim 20 wherein running a feed forward closed control loop includes substantial optimization of multiple outputs

22. (Original) The method according to Claim 1 wherein processing includes transforming each summarized respective corresponding data record cluster into a sub-manifold of a multi-variate data manifold.

23. (Original) The method according to Claim 1 wherein processing includes transforming each summarized respective corresponding data record cluster into a search-space vector.

24. (Original) The method according to Claim 23 wherein transforming each summarized respective corresponding data record cluster into a search-space vector includes arranging at least one search-space vector into a vector look-up table.

25. (Original) The method according to Claim 24 wherein the at least one search-space vector–having been arranged into a vector look-up table–is updated by using a self-correcting adaptive system.

26. (Original) The method according to Claim 1 wherein processing includes:

A. for at least one process control parameter of the at least one set of process control parameters, prescribing at least one process control recipe element for use in the predetermined process juncture; and

B. designating the prescribed at least one process control recipe element for use in the predetermined process juncture.

27. (Original) The method according to Claim 1 wherein said processing includes using robust optimization.

28. (Original) The method according to Claim 1 wherein said processing includes characterizing data in substantially each respective corresponding data record cluster by using a statistical calculation.

29. (Original) The method according to Claim 28 wherein said using a statistical calculation includes calculating a process capability ratio.

30. (Original) The method according to Claim 28 wherein characterizing data in substantially each respective corresponding data record cluster by using a statistical calculation includes arranging the characterized data into a look-up table.

31. (Original) The method according to Claim 30 wherein arranging the characterized data into a look-up table includes using the look-up table and therewith designating at least one process control recipe for use at the predetermined process juncture.

32. (Original) The method according to Claim 31 wherein using the characterized data in the look-up table includes smoothing the data.

33. (Original) The method according to Claims 30, 31, and 32 wherein arranging the smoothed characterized data into a look-up table includes using the look-up table for designating at least one process control recipe for use at the predetermined process juncture.

34. (Original) The method according to Claim 31 wherein using the look-up table for designating at least one process control recipe for use at the predetermined process juncture includes selecting a best available vector and therewith deriving a process control recipe.

35. (Original) The method according to Claim 33 wherein using the look-up table for designating at least one process control recipe for use at the predetermined process juncture includes updating said look-up table by using a self-correcting adaptive system.

36. (Original) The method according to Claim 34 wherein selecting a best available vector for use with the process control recipe includes running a feed forward closed control loop.

37. (Original) The method according to Claim 1 wherein processing includes–to the predetermined process juncture associated with the interconnection cell–applying at least one of the respective corresponding data record clusters to the process occurring at that juncture.

38. (Original) The method according to Claim 37 wherein at least one of the respective corresponding data record clusters is updated by using a self-correcting adaptive system.

39. (Original) The method according to Claim 38 wherein applying at least one of the respective corresponding data record clusters includes reporting a process status, and wherein said reporting is initiated according to predetermined conditions.

40. (Previously Presented) The method for process control according to claim 1 wherein the steps of the method are applied for optimizing a Chemical/Mechanical Polishing processing of silicon wafers.

41. (Currently Amended) A method for automatic programming for adaptive control of a predetermined multi-stage manufacturing process said manufacturing process being defined by ~~cells~~process stages, the method comprising

A. using a mapped plurality of graph-directed expertise-suggested interconnection cell relationships, defining a map referenced interconnection cell therein, said interconnection cell being associated with one of said process stages, said interconnection cell having associated therewith

I. at least one set of input data representing said predetermined multi-stage industrial process or at least one set of industrial process control parameters, and

II. at least one set of output data, usable for predicting the process or stage output for a given setting of said associated process stage; and

B. using the map referenced interconnection cell, designating at least one process control recipe and applying settings to said process as defined by said recipe for the industrial process, thereby to apply control to said multi-stage manufacturing process.

42. (Original) The method according to Claim 41 wherein defining includes, for the map referenced interconnection cell, validating at least one of the mapped plurality of graph-directed expertise-suggested interconnection cell relationships.

43. (Original) The method according to Claim 41 wherein defining the map referenced interconnection cell includes

validating the map referenced interconnection cell by

simulating a validity-metric for an n-tuple of directed graph components of the map referenced interconnection cell.

44. (Previously Presented) The method according to Claim 42 wherein defining the map referenced interconnection cell includes for an n-tuple of directed graph components of the mapped interconnection cell

validating the map referenced interconnection cell by

measuring if each of the at least one set of input data to the map referenced interconnection cell significantly contributes to that map referenced interconnection cell's output, wherein a predetermined convolution of these measurements constitutes an acceptable validity-metric.

45. (Original) The method according to Claim 41 wherein designating at least one process control recipe includes

choosing another process control recipe whenever a particular obtained output value differs from a predetermined target value, by at least a predetermined value,

thereby obtaining a new subsequent offset goal value closer to a predetermined target value.

46. (Original) The method according to Claim 45 wherein obtaining a new offset goal value includes basing the value upon at least one output value from a previous similar process.

47. (Original) The method according to Claim 46 wherein basing a new offset goal value includes analyzing the at least one output value from a previous similar process by running a feed back closed control loop.

48. (Original) The method according to Claim 41 wherein defining a map referenced interconnection cell includes forming at least two search-space vectors.

49. (Currently Amended) An article of manufacture including a computer usable medium having computer readable program code embodied therein for performing multi-stage adaptive process control at a predetermined process juncture, the computer readable program code in said article of manufacture including:

A. first computer readable program code for causing a computer to define an interconnection cell associated with said process juncture and having associated therewith

I. at least one set of input data representing an industrial process or at least one set of industrial process control parameters, and

II. at least one set of output data, predictive of the industrial process output of said process juncture for a given setting;

and

B. tied to the first computer readable program code, an output unit for using said at least one set of input data and at least one set of output data, according to a predetermined prediction model, to apply settings to said industrial process to produce a desired output.

50. (Original) The article of manufacture according to claim 49 having computer readable program code embodied therein for causing a computer to arrange the respective corresponding data record clusters into a look-up table, for the interconnection cell.

51. (Currently Amended) A computer comprising a program storage device readable by the computer, tangibly embodying a program of instructions executable by the computer to perform method steps for performing an industrial process control on a manufacturing process, said method steps including:

A. for a predetermined process juncture, defining an interconnection cell associated with said juncture, having associated therewith

I. at least one set of input data representing an industrial process or at least one set of industrial process control parameters, and

II. at least one set of output data, predictive of the process output for a given setting;

B. for the predetermined process juncture, for the interconnection cell, processing data from said at least one set of input data and from at least one set of output data, according to a predetermined prediction model, into respective corresponding data record clusters; ~~and~~

C. for the predetermined process juncture, predicting the process output associated with said juncture, according to said data clusters, therewith to define settings for said process to produce a desired output therefrom, and

D applying said defined settings to said process.

52. (Original) The program storage device according to claim 51 including therein a method step whereby respective corresponding data record clusters are arranged into a look-up table.

53. (Currently Amended) A computer system for performing control of predetermined adaptive process at a predetermined process juncture including:

A. apparatus for delineating an interconnection cell, said interconnection cell being associated with said juncture and having associated therewith

I. at least one set of input data representing an industrial process or at least one set of industrial process control parameters, and

II. at least one set of output data, usable for predicting the industrial process output for a given setting;

B. a processor for processing data from said at least one set of input data and from said at least one set of output data, according to a predetermined prediction model, into respective corresponding data record clusters, predictive of the industrial process output, and

C. An output unit for using said data clusters to provide settings to said industrial process, said settings being physically applied to said industrial process to achieve a desired output, said settings being selected from said record clusters as those settings corresponding to said desired output.

54. (Original) The system according to Claim 53 wherein the processor includes attached thereto an applier for applying at least one of the respective corresponding data record clusters.

55. (Original) The system according to Claim 53 wherein the computer includes attached therewith at least one sensor for providing an input or output datum to the respective set of input or output data.

56. (Original) The system according to Claim 53 wherein the computer includes attached therewith at least one actuator for providing a process control parameter setting from the respective set of process control parameters, and the provided process control parameter setting is assigned according to a predetermined discrete respective set combination.

57. (Currently Amended) An article of manufacture including a computer usable medium having computer readable program code embodied therein for performing a predetermined multi- stage adaptive process control at a predetermined process juncture, the computer readable program code in said article of manufacture including:

A. first computer readable program code for causing a computer to define a map referenced interconnection cell for association with at least one stage in said multi-stage adaptive process, said interconnection cell having therein a mapped plurality of graph-directed expertise-suggested interconnection cell relationships with neighboring cells associated with neighboring stages, and further having associated therewith

I. at least one set of input data representing an industrial process or at least one set of industrial process control parameters, and

II. at least one set of output data, usable for predicting the process output for a given setting for at least one of said manufacturing stages;

B. tied to the first computer readable program code, second computer readable program code for causing a computer to use the map referenced interconnection cell to designate at least one process control recipe for the industrial process, therewith to physically apply settings to said industrial process defined in said recipe, thereby to provide adaptive control to said process.

58. (Currently Amended) A computer comprising a program storage device readable by the computer, tangibly embodying a program of instructions executable by the computer to perform method steps for performing industrial process control of a manufacturing process, said method steps including:

A. for a predetermined process juncture of said manufacturing process, using a mapped plurality of graph-directed expertise-suggested interconnection cell relationships, defining a map referenced interconnection cell therein having associated therewith

I. at least one set of input data representing ~~an industrial~~said manufacturing process or at least one set of ~~industrial~~ manufacturing process control parameters, and

II. at least one set of output data, usable for predicting the process output associated with said juncture or said manufacturing process for a given setting; and

B. for the predetermined process juncture, using the map referenced interconnection cell, designating at least one process control recipe for the industrial process, and physically applying settings to said industrial process in accordance with said recipe.

59. (Original) The method according to Claim 1 wherein processing data from the plurality of respective formed set combinations into respective corresponding data record clusters includes installing at least one data record cluster correspondence as a front end to a neural network, wherein the neural network is used for controlling an aspect of the process at the predetermined process juncture.

60. (Original) The article of manufacture according to claim 49 including a computer usable medium having computer readable program code embodied therein for performing strategic process control at a predetermined process juncture, the computer readable program code in said article of manufacture including: tied to the third computer readable program code, fourth computer readable program code for causing a computer to process data from the plurality of respective formed set combinations into respective corresponding data record clusters, for the interconnection cell.

61. (Original) The system according to Claim 53 wherein the processor includes attached therewith at least one actuator for providing a process control parameter setting from the respective set of process control parameters, and the provided process

control parameter setting is assigned according to a predetermined discrete respective set combination.

62. (Currently Amended) A method for automatic adaptive control of a predetermined multi-stage manufacturing process said manufacturing process being defined by ~~cells~~ process junctures, the method comprising processing ~~process~~ at a predetermined process juncture, the ~~method~~ processing comprising:

A. defining an interconnection cell at said juncture having associated therewith:

I. at least one set of input data, representing ~~an industrial~~said manufacturing process and

II. at least one set of output data, usable for predicting the process output at said juncture for a given setting;

B. defining a model to describe a correlation between said at least one set of input data and said at least one set of output data; ~~and~~

C. using said model to obtain an input set combination to provide a predetermined output value for the ~~industrial~~ manufacturing process, and

D. physically applying said input combination as settings for said ~~industrial~~ manufacturing process in order to achieve ~~a~~ said predetermined ~~desired~~ output ~~therefrom~~value.

63. (Previously Presented) The method of Claim 62, wherein said at least one set of input data is selected from the group consisting of at least one controllable input and at least one measurable input.

64. (Previously Presented) The method of Claim 63, wherein said model comprises a function.

65. (Previously Presented) The method of Claim 64, wherein said function is derived using at least one item selected from the group consisting of expert suggested advice, data derived functions and Design of Experiment.

66. (Previously Presented) The method of Claim 65, wherein said model obtains said input set combination using at least one item selected from the group consisting of a neural network, Process Output Empirical Modeler and a numerical solver.

67. (Previously Presented) The method of Claim 66, wherein said input set combination is comprised of at least one item selected from the group consisting of said at least one controllable input and said at least one measurable input, wherein said model controls said at least one controllable input.

68. (Previously Presented) The method of Claim 63, further comprising the further step of using said model to predict an output value within constraints of said at least one set of input data.

69. (Previously Presented) The method of Claim 63, wherein said model comprises an algorithm.

70. (Previously Presented) The method according to claim 21 wherein said multiple outputs are optimized by multiplying weighing constants, obtained by a predetermined mathematical function.

71. (Previously Presented) The method according to claim 1 wherein adaptive process control parameters are obtained by running a feed back process control loop.

72. (Previously Presented) The method according to claim 71 wherein adaptive process control is based on measuring parameters of multiple product lots.

73. (Previously Presented) The method according to claim 71 wherein adaptive process control is based on measuring parameters of a single previous product lot.